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BETTER UTILIZATION OF MILITARY MANPOWER THROUGH THE USE OF MANAGEMENT ENGINEERING TECHNIQUES

By

Thomas Louis Conroy

For

Doctor A. Rex Johnson

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PREFACE

Military manpower is one of, if not the most important resource that a nation possesses. Its importance is perhaps more in the thoughts of statesmen today than ever before. The monopoly of such wholesale destructive devices as the atom and hydrogen bombs a few years ago was considered to be the great equalizer for small populations against the great. That is no longer true today. The nations of great populations also have access to these nuclear annihilators.

The threat of war with the Soviet Union and its satellites casts an ominous shadow of apprehension in the minds of peoples of those nations that do not subscribe to the communistic ways of life. The communistic sphere today embraces 900 million human beings, or nearly half of the total population on earth. It is no wonder that the military leaders of the United States, with its mere 160 million people, are concerned over the international situation. Even with all of our powerful weapons will we be able to stop the swarm of orientals if they decide to overrun the world? The odds are definitely not in our favor. This clearly indicates that we must make every effort to get full utilization from what manpower we do have. This paper deals with one form of application of that effort.

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INTRODUCTION

The tremendous consumption of human lives and natural resources in World War II achieved one significant result - it halted Germany and Japan in their attempted conquest of Europe and Asia. Today, while the rubble of that war is still being cleared away, the nations of the world find themselves divided into two armed camps each with its own concept of government and life. The communistic countries on one side and the democratic on the other.

The Communists have demonstrated in Korea and Indochina they have one overall philosophy - "might means right". Those countries that can't be "converted" to communism by political means are being converted by invasion and war. This aggressive ideology has forced the democratic nations to amalgamate their strength and to maintain the largest peacetime military forces in history as insurance for their own survival.

The United States emerged from World War II as the strongest of the democratic countries both militarily and financially. The balance of power to maintain the freedom of the non-communistic world has become its responsibility. This demands a military establishment sufficient in size and potent enough in power to back up these world-wide commitments. It also demands that the United States taxpayer is the one that will pay the bill.

The taxpayer has the right to ask that he gets the most defense possible for his tax dollar. The Department of Defense, aware of its responsibility to the taxpayer, is doing everything in its power to improve the efficiency of the armed services. It is making improvements daily in management procedures and business-like methods in its program of "more bang for a buck".

The Navy as part of the defense team is doing its part in the improvement program. The Navy is big business. It is five times as large and many times as complex as the eight largest corporations in the United States. It therefore must assume a leading role in advancing the science of management and administration to better control the attendant costliness of a necessarily large peacetime Navy.[1]

The Navy has adopted many of the proven business practices used by America's largest corporations. It has established a performance budget to better plan its expenditures and justify its appropriations. More emphasis has been placed on cost consciousness, cost control and overall efficiency. More similar tasks are being done with less personnel than ever before. Scientific management procedures have been installed in many organizations throughout the Naval establishment. There are still areas however that can be improved considerably by the application of modern management practices. One of these areas, military manpower utilization, will be discussed at length in this paper.

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[1] Office of The Management Engineer, Navy Department. Manpower Control Manual (Washington: 1952), 1.

SHORTAGE OF MILITARY MANPOWER

The Navy's budget for fiscal year 1955 requested $10,440,000,000. That portion of the budget strictly for pay of military personnel amounted to $2,463,055,000 or 22% of the entire Navy budget. Any improvements in the utilization of military personnel in the Navy that would more efficiently perform existing tasks would result in substantial overall savings. For example--a five percent improvement throughout the Navy would reduce personnel required for the same tasks by five percent, thereby releasing a manpower total large enough to man all the Naval Air Stations in the continental United States; or applying the five percent improvement to the cost of personnel would release enough money to pay for the entire Navy Civil Engineering maintenance and operating budget for fiscal year 1955 ($115,000,000), or one and a half times the 1955 Medical care budget ($83,429,000), or twice the sum budgeted for Research in the Navy ($61,000,000), or twice the cost for Construction of Ships, Navy (56,700,000).

The 1955 budget limited the manpower ceiling in the Navy to 682,000 military personnel. This was a reduction of 58,000 personnel under the 1954 level with practically no reduction in the military mission. Military allowances for similar functions have been reduced substantially since the end of the Korean war, but even with these reductions 682,000 personnel are just not enough people to fill present allowances. The Navy is meeting this crisis by manning billets at seventy-five percent of wartime strength with a calculated twenty-five percent loss of completely accomplishing assigned missions.

The operating forces of the fleet are the Navy's first consideration in keeping at fighting strength. Manpower reductions must be carefully applied or some phases of the overall strategic plans will suffer for the benefit of

others. The shore establishments receive the first and biggest personnel cuts; but too deep a slice into the personnel level of the shore establishments will leave the fleet hamstrung with too little support, and neither will be able to perform its mission. There are two alternatives; cut allowances across the board and do the best with what is available or keep the fleet manned at a sufficient level by transferring personnel from the shore establishment and filling the vacancies ashore with civilians. The latter seems the wiser course at first consideration. With no reliable data available on the subject it is estimated by the writer that ninety percent of military billets in the shore establishment could be filled with civilians with no appreciable loss in performance of assigned functions. Studies are underway at the present time to determine the feasability of this plan. One of the large Naval Air Stations in the continental United States has submitted data that indicates it could release six hundred military personnel for the fleet replacing them with five hundred civilians, and still operate at a successful level. The comparative cost of five hundred civilians to six hundred military would probably be about equal due to the higher pay of civilians. It is assumed that the replacement civilians would already be qualified in the billets and no trainees would be needed. Therefore, five hundred civilians could perform the same tasks as six hundred military with its usual percentage of inductees undergoing training. Also, the civilian force would not be subject to reductions in on-the-job time due to mess cooking, military musters, inspections, etc., as is the military.

It must be mentioned at this time that before the Navy gets too far into the program of replacing military with civilians that full consideration be given to its long range effect. This may be a splendid 1955 solution, but how will it appear five years hence? What will it do to morale of the

military? Will it enhance the keeping of career men in the service if they spend year after year at sea because the heretofore shore billets are all occupied by civilians?

The present policy for allocating military personnel to shore billets is:

1. The law requires a military person.
2. The task requires military training.
3. Military personnel requires training for future assignment.
4. For rotation requirements.
5. Security considerations dictate use of a military person.
6. Duties, location, hours of work, best filled by military.
7. Inter-service or public relations dictate use of military person.
8. Whenever the case is borderline preference shall be given to civilian.

In applying the above criteria it immediately appears that there are many billets which will fall in the twilight zone where a military person is required-or is not required. The language used has such indefinite limits that it will be little trouble to justify that civilians can occupy the majority of shore billets if such policy is adopted.

There are many arguments both for and against such a policy; however, the one significant fact that over-shadows all others is the irreparable damage it will do to the morale of the Navy's military personnel if a large percentage of shore billets are turned over to civilians. The old axiom in this case would most certainly apply- "once lost never regained." Any appreciable trend in the direction of replacing military with civilians in the Naval Shore Establishment would increase the length of time the military will spend at sea and therefore that much less time ashore. Would eight years at sea and

one ashore improve the morale of the Navy? Would it be an incentive to improve the enlistment rate which now is at an all time low? On the contrary, the volunteer enlistee would be an unknown entity in the service that once boasted more volunteers and a higher enlistment rate than either of her sister services.

Within the last year the Navy has adopted a policy of establishing additional shore billets in certain critical ratings because sea-shore rotation has been so slow as to discourage reenlistments.[1] This policy was enacted solely in an attempt to keep good men in the Navy by lengthening the ratio of shore duty to sea duty. It wouldn't be consistent to recognize this fact today and disregard it tomorrow.

With the above observations in mind it is evident that high service morale and reenlistment of experienced enlisted personnel have some relation to the occupation of billets ashore. All other means must be exhausted to improve the utilization of man-power so that assigned tasks can be accomplished with the minimum number of personnel.

United States Navy Regulations, 1948 edition, art. 0704 states it is the Commanding Officer's responsibility to "exert every effort to maintain his command in a state of maximum effectiveness." This responsibility requires that a constant appraisal be made of all command functions in an effort to eliminate bottlenecks, cut red tape, build up morale, and in general encourage more efficient methods of operation. It is just as much the responsibility of the Commanding Officer to reduce personnel costs as it is to salvage damaged

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[1] Navy Management Staff. Examples of Accomplishments under Navy Management Improvement Program. (Washington; 1954), 47.

equipment or to prevent waste of supplies and materials assumed by the command.[1]

Management Engineering practices and techniques are some of the tools that a Commanding Officer can utilize to achieve maximum effectiveness. It is a specialized field that must be thoroughly understood for the benefits thereof to be realized. It would be beneficial if the Navy could afford to hire a staff of management experts for each of its commands. This being impossible, an educational program on the basic principles of management techniques is a good starting point.

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[1] Bureau of Naval Personnel, Personnel Analysis Division. Work Simplification for Naval Units. NavPers 18359. (Washington; 1953) 1.

WORK MEASUREMENT IN THE NAVY

There is no overall Work Measurement System for the Navy at the present time. In April 1952 the Under Secretary of the Navy established a central integrated Work Measurement System for the Navy Shore Establishments. This was in effect for only two years when it was cancelled because of vehement objections by the Bureaus and Offices of the Navy Department. Since then the Bureaus of the Navy have distributed their own version of a Work Measurement System to their respective shore commands. These systems in general are applicable to industrial type activities. None of these systems put any emphasis on the application of Work Measurement Principles to military personnel. Allowances for military billets, both officer and enlisted, are developed from requirements based on the best estimates of experience in the billet function involved. The allowance is often subject to a percentage cut to keep within personnel ceilings, with no scientific system to determine what functions can best withstand the cut. A measurement of billet functions by Management Engineering Techniques is feasible and would give an accurate basis for fitting manpower to functions instead of just manning the billets.

ORGANIZATION STRUCTURE

The first consideration in evaluating the best utilization of manpower is the soundness of the present organization. Is it up to date and does it reflect the present functions? Good organizing work requires planning. Periodic evaluation to determine whether the organization structure is meeting present and anticipated needs should be made. Too frequently an organization structure is permitted to expand or contract without any overall plan. Changes take place on the basis of expediency, with little regard for design or proper balance. Lack of balance in organizational work can result in (1) functions becoming disproportionate--some are given more importance than their true value warrants and some less importance, (2) some functions are almost entirely neglected, (3) each unit of the organization structure stresses its individual problems and its particular importance to the exclusion of all other units, (4) encouragement of empire building by various segments is encouraged.[1]

Organizing is a dynamic activity; it should take into account changes in the mission, whether these changes be in goals, scope, or personnel. This is very applicable to any Navy activity because of the great variation of goals due to the annual changes in appropriations each fiscal year. Just because an organization supported the functions one year is no reason that it is the best organization for any succeeding year. This means a constant reappraisal to tailor the organization to the mission.

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[1] George R. Terry, Principles of Management (Homewoood, Ill.: Richard D. Irwin, Inc. 1953), 148.

How to appraise the existing organization? The following steps are suggested:

1. Know the objective.
2. Determine the functions necessary to achieve the objective.
3. Group the functions into practical units.
4. For each function or group of functions to be performed, define clearly the duties to be carried out and indicate by whom.
5. Assign the best qualified men available.
6. Indoctrinate assigned personnel with respective function or functions, duties, and relationships to other members of the organization structure.

The Navy Department has issued instructions that predetermine the organizational structure of all standard Navy commands. These structures usually go to the departmental level or in some cases to the divisional level. They are broad enough that most activities can operate efficiently within the framework of the prescribed organizational structure. It is the organization below the divisional level that is left to the individual commanding officer. It is in this area that the capable administrator expends his effort and achieves results, good or bad.

For maximum effectiveness, an organization structure must be understood accepted and utilized by all who are affected by it. There is a tendency in the Navy to proceed on the principle that the officers and the leading petty officers are the only individuals that need to know why a certain task has to be done a certain way. Not enough time and effort is expended to indoctrinate all hands on how each little job is a segment of the overall mission, and no matter how insignificant it may seem is necessary for the accomplishment of the total task. The structure should be kept free of complicated functional groupings and involved relationships. The key to most problems is to reduce them

to the simplest terms possible. Simplicity also provides for organizational flexibility. A complicated organization structure slows up the entire work process, especially when experiencing changing conditions as the Navy does each Fiscal Year.

Authority and Responsibility

Authority should be commensurate with responsibility. Authority is the power or the right to act, command, or exact action by others. Authority implies the power of making decisions and of seeing that they are carried out. Responsibility is the obligation of an individual to carry out assigned activities to the best of his ability. The dispersing of adequate authority and responsibility throughout an organizational structure is achieved by means of delegation. Delegation means conferring equal portions of authority and responsibility from one organizational level to another in order to accomplish particular assignments.[1] The Commanding Officer of an activity cannot possibly personally supervise every facet of each task in his organization, although there are those who attempt to try. The Navy operates on the military principle that authority and responsibility rests with seniority. It is important that the organization structure is designed to operate in this autocratic manner; but it must be remembered that although authority and responsibility can be delegated, the individual delegating always retains his overall authority and responsibility for the assigned functions whether he wishes to or not. Delegation does not mean the permanent release from these obligations but rather the granting of rights and approval for others to operate within prescribed areas. The delegator always remains accountable for what is or

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[1]George R. Terry, Principles of Management (Homewood, Ill.:1953),157.

is not accomplished.

Channels of Supervision

An organization structure sets forth the means or avenues along which control can be exercized over the activities of each organization unit. The flow of formal information is two way--up as well as down--and nothing should be permitted to impede this dual flow. Over-lapping of supervisory efforts should be avoided. Definite areas are connected by clearly defined channels so that there are no horizontal gaps. In this way the activities of each unit can be properly supervized by a single unit of the immediate higher organizational level.

Span of Control

Span of control is the number of persons a supervisor can adequately direct or supervise. There is no exact number recommended. If the number is large the supervisory powers are diluted and usually means poor coordination and control. If the number is too small there is a situation of "too many Chiefs and not enough Indians," and this leads to menial and insignificant tasks for individuals that have greater capacities. No hard and fast rule can be applied; it depends a great deal on the individual involved and only and experienced appraisal of each supervisor's abilities will arrive at the best solution.

Organization Charts

After the organizational structure has been studied to see that it reflects the functions of the activity the organization chart should then be drawn. The organization chart is a useful tool to help visualize an organization structure as a whole. The chart should reveal what functions are per-

formed, their grouping, and their relationships with each other. The lines joining the various blocks representing the functions indicate the channels of formal authority and responsibility. For the greatest value organization charts should possess (1) pattern and grouping of the functions, (2) indicate the channels of formal authority and responsibility, (3) uncover any needless duplication of functions, (4) indicate any situations where the same person is handling unrelated functions, and (5) reveal functions that are either too extensive or too limited for efficient handling.

Fitting Personnel to Functions

Now that the organizational structure has been corrected in accordance with assigned mission the problem now is how to determine the number of personnel needed to carry out the functions as indicated. A healthy estimate can produce a figure that would give an allowance total that would do the job--but merely following the organization chart will not result in the best utilization of manpower. Some proven system must be used. No longer can the Navy depend on an abundance of personnel to get the job done. It must do the job with the minimum number of personnel, for all of a sudden personnel has become the scarcest of the resources. Management engineering practices are some of the tools that are available to achieve the best utilization of manpower. Management engineering has been used in American industry for years and has been used on a small scale in Navy activities that employ a large proportion of civilian personnel. It has never been applied in a purely military area. The writer proposes that there is just as fertile a field in military personnel as has been proven in the field of civilian personnel.

The Bureau of Supplies and Accounts has proven the value of a Work Measurement program in its field activities. These activities are staffed

predominately with civilian personnel and the types of work are very applicable to Work Measurement techniques. Over the past two years savings of $100,000,000 has been effected by having a work measurement system in operation. This does not mean that a work measurement system directly increased the efficiency of all the operations to such a degree that this sizable sum was saved, but it does mean that because a system was in operation when work loads were reduced the areas of reduction could be immediately identified and personnel reduced accordingly; and in areas of no reduction of work load the overstaffed areas were brought to light.

These same systems of work measurement that are used in the Bureau of Supply and Accounts and other Bureaus of the Navy can be applicable to military as well as civilian.

THE TECHNIQUE OF WORK MEASUREMENT

What is Work Measurement

Work measurement is a term used to define a relationship--a relationship between the volume or quantity of work performed and the output of labor or manhours required to complete that volume of work. This relationship is the basis for and a most significant factor in an understanding of work measurement.

Work measurement is designed to produce quantitative, not qualitative measurements. Regular inspection systems provide the latter.

Results to be obtained from work measurement, as in the case of results from any system that embodies the principle of measuring time versus performance, are valid only when the basic data are comparable, and when there has been an identification of the variables that affect either factor.

Types of Work Measurement

Basically, there are at least two types of work measurement systems. One is the "engineering" type, related in some manner to the use of time and motion studies, where the movements are timed and calculated with some precision and minuteness of detail. Thus, an individual's operations can be analyzed on the basis of similar and varying circumstances in several successive operations. The most frequent expression of standards in this type would be a specific time for the performance of a given task by one person. Thus, the performance of workers is judged against rather precise time requirements for the task.

The second type generally referred to as "statistical" work measurement. There are two basic departures from the engineering type measurement. First, the data are usually developed from statistical analyses of past performances, and second, the measurements are usually directed toward group rather than individual performance. Thus, the data developed are of a broader character than the more precise standards obtained through the use of the engineering techniques. It is this statistical type that will be referred to in this paper.

Terminology in Work Measurement

The value of the data to be obtained from the operation of a work measurement system is predicated upon a universal understanding of terms used.

Work Measurement.--An equitable relationship between the volume of work performed and the manpower used.

Function.--The major division of work in accomplishing the objective of the enterprise.

Work Unit.--The basic component of work needed in the performance of a function.

Characteristics of work units in most work measurement systems may be summed up by the following criteria.

A Work Unit:

1. Must be readily countable.
2. Must express output.
3. Must reflect work effort.
4. Must have consistency in that it should have the same meaning throughout the enterprise, and from one time period to another.
5. Must be expressed in the terminology that is familiar to workers in all levels of the system.

Manhour.--A unit of measure equal to one person working for one hour.

Performance Rate.--The amount of time required to produce a work unit. This is a computed figure, and is determined by dividing the number of manhours by the number of work units performed. If, for example, a person could change spark plugs in an airplane at the rate of ten per hour, the performance rate would be .10 hours.

Standard.--In the engineering sense, a standard is determined by actually measuring the time for performance of a work unit.

Standard manhours.--The product of the performance rate or standard as multiplied by the number of work units completed or processed.

Work Load.--The total number of work units scheduled to be completed in a given time.

Setting up a Work Measurement System

Once it has been decided that an activity would benefit from a work measurement system several steps are necessary:

1. Determine generally the work to be measured.
2. Determine the levels of measurement.
3. Determine and define the work units to be used.
4. Develop procedures for collecting and reporting data.
5. Establish standards of effectiveness.
6. Determine in advance the ways in which data can be used.

Measurement of work just for the sake of knowing how much is being done does not justify the establishment of a work measurement system. Will the cost of measurement be unreasonable when compared with the cost of performing the function? Will the measurement at some point interfere with the actual accomplishment of the work being measured? The danger of carrying the

measurement of work performance beyond the point of diminishing returns must be considered. Management must be realistic and practical in determining the extent down at which measurement will take place.

Uses of Work Measurement Data

The availability of work measurement data provides:

1. An estimate of time required for the completion of a given volume of work.

2. Information for the establishment of working schedules.

3. Data useful in maintaining effective personnel assignments.

4. Data for evaluating the effect on productivity of changes in organizations, procedures, training, etc.

5. Data for estimating future personnel needs.

Limitations on Use of Work Measurement:

1. Work measurement is not a measure of results achieved by performing work.

2. Work measurement is not a measure of effects produced by performing work.

3. Work measurement is not a measure of quality.

Some Reasons for Failure of Work Measurement Systems:

1. Lack of understanding and appreciation on the part of responsible heads of divisions and departments of work measurement and its potentialities.

2. Resentment and resistance to being evaluated and measured.

3. Failure to adequately break down operations and functions and select appropriate work units.

4. Failure to obtain sufficient experience and select representative time periods for developing conclusions and results.

5. Tendency for over-simplification. This usually results in formulating single work load factors for top management consumption and ignoring the requirements and utilization at lower levels.

It is a common reluctance on the part of normal individuals to have their work measured. Besides the objection of resistance to change is the doubt in mind as to what action higher authority will take on the basis of the results of measurement data. One of the first reactions is that it will be used to cut personnel or used as a basis of reprimand. So many Naval activities are subject to frequent excess work loads for short periods of time or crash programs of one sort or another that over a period of years the allowance has developed a built-in cushion of personnel to take care of crash programs, and such insurance is considered justified and normal; however, in many activities this cushion has lost its identity. Past experience in this case would assess the allowance as necessary and only a system such as work measurement would uncover the excess personnel. At least the excess would be accounted for and it would be up to higher authority to decide whether the personnel could be better utilized elsewhere.

Work measurement data reduces opinions to facts. For example, a division officer complains to his department head that he needs more personnel to get his job done. If the department head has work measurement facts on past performance, he is in a good position to make the division officer justify his request for more men. Thus, the department head protects himself from letting a would-be empire builder talk himself into additional personnel. There is the case on record at one of the large southern air stations where the work load increased to such an extent that it was decided to open one of the auxiliary fields that had been closed since the end of World War II. Based on past experience, an allowance of three hundred personnel was given the field to commence operations. After two or three months the newly opened field requested an additional one hundred men because of difficulty in keeping up to schedule. A survey team was sent to the field to measure exactly

what the field needed to perform its mission. The findings of the survey team showed not only that the field did not need an additional one hundred men but that it had fifty too many men at the present time. This finding was based on data of how many personnel was needed for each function, rather than on what someone thought was needed based on experience in World War II.

Work measurement is not the only tool in good management and should not be used in an attempt to replace all other management tools. But of all the tools available work measurement is probably the best starter, because:

1. It shows where a detailed analysis of Naval management problems may be beneficial.

2. It lends itself to the development of a broad approach to the solution of management problems, taking into account the many factors which relate to these problems.

Why Install A Work Measurement System

Among the main reasons for the establishment of a work measurement system for the measuring of work volume performed are:

1. To determine a measure of performance.

2. To determine effectiveness over successive time periods.

3. To provide data for management purposes generally.

Installing A Work Measurement System

Work measurement is an administration technique, which operates as a barometer in indicating the manpower used and the resulting output. When used in the proper manner, it will operate as a motivating force for improving management. Conditions necessary for its success are the proper setting of attitude and acceptance, including "acceptable" standards and the wholehearted backing of higher authority. Under these conditions work measurement provides a means of focusing attention on areas of management where improvement is needed

and for providing a means of indicating when progress is made.[1]

There are two basic methods of starting off a work measurement system at a Naval activity, (1) A visiting team of specialists who come aboard the station and set up the system, and (2) with a manual accompanied by some staff assistance; the installation carried out by the Commanding Officer and his staff. The latter is the most practical, and to do this the following steps are necessary:

1. Orientation of the Commanding Officer.
2. Orientation of key personnel in each department.
3. Individual field work in each department.
4. Continuous review and follow-up.

Active backing of top echelon is imperative to acceptance of any new system. If the Commanding Officer is interested in work measurement and actively backs it, the department heads are more apt to accept it and push it. If the department heads are interested in work measurement and actively back it, the division heads are more apt to accept and push it, and so on down the line.

Orientation and understanding by the top echelon will make obvious these values of the system to the Commanding Officer:

1. Work measurement serves as a means of constant review and follow-up.
2. Work measurement serves as a means of communication since it enables the Commanding Officer to get the word better on what is going on in the departments of his command.
3. Work measurement should be instituted only as a permanent pro-

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[1]Ohio State University Research Foundation, Local Command Work Measurement Program as a basic step in Management Improvement. (Columbus, Ohio:1953), 23.

gram since its value increases continuously as more data are collected with the passage of time. The accumulation of work measurement facts should prove indispensable as a management aid and for planning, forecasting and budgeting.

For a work measurement program to be really effective it must not only be understood in every echelon of the command but it must be accepted by all personnel as some worth to themselves in doing their job. This acceptance depends upon some or all of the following variables:

1. Appreciation of how the system will affect their own status, directly or indirectly.

2. Understanding of how the system may affect their own expenditure of effort on the job.

3. Degree of breadth of vision concerning overall naval personnel and management problems.

4. Degree of fear that information coming from the system may be hastily or improperly used by higher administrative echelons and that decisions may be made on the basis of incomplete information.

5. Degree of participation on the part of the people at the division and departmental level in regard to the details of setting up the system.

6. Realization that the commanding officer considers the system important and that some follow-up action will be taken.

This follow-up action is important. Nothing is so frustrating as to spend a lot of time and effort gathering data and making out reports only to find that the reports are only for reports sake and never used.

After the different echelons of the command have been indoctrinated in the general aspects of a work measurement system, the following factors will have to be decided upon as they apply to the type of command functions:

1. Acceptable work units.

2. The recording of man-hours expended.

3. Setting standards.

In applying the above factors each function should be broken down to the

smallest sub-functions practicable. Starting with the subfunction the factors are applied, resulting in data on the man-hours expended, work units completed, and performance rates. In this way the data at the basic operating unit can be built into data for the section, the section data accumulated into the data for the division, the division to the department, etc. until the entire command has a measuring system. For example, let us begin with the battery shop as a unit of the electrical section of the engineering division of the maintenance department of a Naval Air Station. One of this unit's function is to check the batteries of an aircraft when the aircraft is undergoing a thirty-hour check. This function can be measured as the man-hours expended to check the batteries of a certain type of aircraft on a thirty-hour check. The other functions that are carried out in the performance of the thirty-hour check for the entire aircraft can be similarly measured, accumulating a set of data that will provide the Maintenance Officer with the man-hours necessary to perform a thirty-hour check on a certain type of aircraft. Each function throughout the check can be broken down into separate measurable segments from which can be established whether all personnel used in the performance of the check are being utilized efficiently. These data over a period of time will make it possible for each unit of the maintenance department to derive a standard performance rate for its function on a thirty-hour check.

No such standards exist in the Navy at the present time. There is no performance rate in the Navy for example--the man-hours required to perform a thirty-hour check on a JRB aircraft. Yet the Navy has hundreds of JRB aircraft that are being checked daily. At one station six men will perform a thirty-hour check and it will take them a whole working day. At another station the same check will take only a half working day, and on still another station a day and a half will be the scheduled check time. With the application of a work measure-

ment system to this function it could be determined not only the hours required, but the exact number and rate of the personnel involved. Expand this further to include the man-hours needed for all types of aircraft for all types of checks and routine maintenance and it would be a simple problem to determine the number of personnel required for the maintenance department.

Identifying Areas of Work Measurement

Broadly speaking, all work of a station may be classified into:

1. Operative or measurable work.
2. Managerial or unmeasurable work.

Operative work is concerned with turning out projects and is easily countable in terms of physical units turned out. Some examples are: number of pages typed, gallons of gas delivered, and number of meals served. Managerial work consists of planning, organizing, and controlling or supervising the work of others. It is concerned mainly with groups, and its effectiveness is judged by the effectiveness of the group it controls. Leadership is one of its main functions. This makes managerial work highly intangible and difficult to count in terms of work units turned out. Some examples are: division officers, department heads, and officers-in-charge.

Although most operative work is measurable, there is some work the output of which is most difficult to measure in quantitative physical units. The activities of a crash crew, sentry watches, desk watches, etc. fall into the category of unmeasurable operative work. But this does not mean that it shouldn't be accounted for. The function should be listed and the amount of time spent on it. It is important in regard to operative work that a certain amount of flexibility must be allowed. Where it is impossible to measure work, or the value of it can be questioned, other ways of handling it must be considered.

A work measurement report is a little value unless the total number of personnel, the functions they perform, work units turned out (for measurable work) and time available used to do the work are specified. This means that all operative work both measurable and unmeasurable and all managerial work will be accounted for in the work measurement report.

Selecting Work Units

In looking for a work unit, it should meet the following requirements:

1. Is it countable?
   The work unit must be capable of being counted. For example: transfer orders processed, gasoline consumed, etc.

2. Is it representative of the work accomplished?
   The work unit must adequately represent the work effort and work turned out for a function or subfunction. For example, mileage is not a good work unit for gasoline trucks for refueling planes if they are going to be compared with trucks hauling stores. Gasoline refueling trucks are parked most of the time and then move only a short distance to refuel the planes. Where on the other hand trucks hauling stores are on the go most of the time and cover considerable mileage every day. Gallons of gasoline delivered would be a better unit for the gasoline trucks and ton-miles hauled for the stores trucks.

3. Is the quality of the work unit consistent?
   The work unit should be standardized for quality so that over a given period of time the quality of the work will be on a fairly even keel.

4. Is the terminology consistent and familiar?
   Where there is similarity in work among several groups consistency and use of familiar terminology is important. Typing correspondence is common to a number of departments. Even though all letters are not the same length, they will average out so a unit for all could be a piece of correspondence typed.

5. Does the work unit measure what is wanted to control?
   The work unit preferably should be an end product of the function or functions that are desired to control.

Examples of Work Units

Division	Work Unit
Personnel Division	Personnel Records processed Pieces of correspondence typed

Division	Work Unit
Operations Department	Number of hours flown Gallons of gas delivered Number of flight clearances approved
Maintenance Department	Number of spark plugs cleaned Number of radio tubes tested

Setting Up a Reporting System

A proper reporting system should include records for the collecting of workload and man-hours expended, and reports for transmitting data. These data should be collected at a convenient time when the records are being worked on anyway, such as each week or every two weeks. These reports should flow up from the unit or group level to the comptroller for compilation for the Commanding Officer. It will be surprising how much of the data needed for the work measurement report is already available in other reports.

Computing Performance Rate

A performance rate is the man-hours expended divided by the work units completed. The following are examples:

Subfunctions	Description of Work Units	Man-hours Expended	Work Units Completed	Performance Rates
Transfers	Number of men transferred	2400	600	.4 man-hours
Correspondence	Number of pieces of correspondence	2000	15000	.133 or 8 minutes

The real value of a local work measurement system comes from continuous review and analysis of the reports. For better analysis the following should be done:

1. Collect monthly Work Measurement facts.

A work sheet is recommended for this purpose. Man-hours expended and work units completed are recorded weekly, and totaled for the monthly report to the Commanding Officer.

2. Calculate Performance Rates.
Performance rates can be calculated from the data compiled in the work sheet.

3. Choose Temporary Standards.
In order to compare this month's performance with subsequent monthly performances, it is necessary to establish a standard performance rate for each subfunction. The reason for selecting a temporary standard rate is to provide a base for analyzing the trend in performance. Experience must be relied upon to a large degree in setting temporary standards. It remains for time to validate the temporary standard, or refute it.

In choosing temporary standards a number of problems may be encountered. There may be excess personnel on board, so that many of them simply do not have a full day's work to do. Some personnel may be in on-the-job training, doing some work but not equaling the work a well qualified individual can turn out. Or a standard for one level of operation may not be applicable equally when the workload is greatly increased. The latter may be illustrated by a galley example. Let us say that five thousand rations are being prepared by fifty mess cooks. If it suddenly becomes necessary to prepare ten thousand rations, it may not be true that twice the number (one hundred) cooks are necessary. Perhaps only a third more cooks are enough.

The temporary standard may be a rough estimate, but it will provide a useful guide until enough facts can be collected to arrive at a sounder standard.

4. Calculated Standard Man-hours.
Standard man-hours are derived by multiplying temporary standard performance rates by work units completed.

5. Calculate Productive Efficiency--an index of man-power utilization. This is found by dividing total standard man-hours by total of actual man-hours expended to obtain the percent that standard man-hours are actual man-hours.

6. Set Standards based on performance data to be in effect as long as applicable to present conditions.

An example of measuring of performance is the program used by the Standard Oil Company of Ohio nicknamed SWAP. The program involves the use of Standard Unit Time factors for each operation performed. The volumes processed during the month, multiplied by the Standard Unit Time factors, results in Standard Manhours, which can be contrasted with actual man-hours.

The total Standard Unit Time is compiled by adding time factors for each step in the operation. Then the Standard Unit Time for each routine is multiplied by the number of times that routine occurs during the month. The result of this multiplication is the standard man-hours for a normal month for this routine. All the standard man-hours for all operations in the unit are then re-capped. This provides the basic measuring stick against which actual manhours can be compared. A comparison at the end of the month showed in some areas that over-all volume of activity did not justify the existing personnel strength. Certain areas were handling a heavier than "average" volume. This gave management a basis to better balance assigned personnel to the specific areas where they were needed, and to transfer excess personnel to the heavier work volume areas.

This same procedure is applicable to most work operations performed by military personnel in the Navy, whether it's clerical operations or maintenance operations. Once the standard man-hours for an operation has been derived, the volume is the only variable. Forecasts based on known volumes for the future periods can accurately forecast the personnel needed to perform the task.

Review of Progress

A good approach to evaluate the progress of the Work Measurement System is to hold regular weekly meetings with supervisory personnel to review work measurement data and plan for improvements and any changes. Corrective action

can then be instituted at the time that situations are brought to light. Besides improving projects, it may be advisable to institute a program of training, aimed at equipping officers and other supervisors with the understanding of management techniques necessary for the solution of the specific difficulties and the problems being experienced by the activity.

One of the most important problems in the Navy today is supporting personnel allowances. The local work measurement data represent a significant forward step in putting such justification on a factual plane rather than on opinion. The system will not only isolate the areas where there may be excess personnel, but will also indicate where there is a shortage of personnel to adequately perform some functions. It will identify bottlenecks in the flow of work where a shortage of a few personnel in one small subfunction may be holding up the work of larger groups of personnel.

WORK SIMPLIFICATION

Work simplification is another management engineering tool to aid management in doing a better job.

Work simplification is a common-sense, systematic method of identifying and analyzing work problems, developing solutions, and installing improvements. This program--drawing on the great and often un-used resevoir of practical knowledge represented by officers and leading petty officers--aids the commanding officer in insuring maximum use of available manpower. Work simplification permits continuous evaluation of command organization by analyzing existing methods, improved tools, better working conditions, or procedures. However, these better methods are not always apparent. Skills in the use of selected work simplification techniques are developed through informal conferences and application in the work situation, supplemented by an active follow-up program. This organized and logical approach is designed to find easier and better ways of doing work.[1]

Work simplification affects all command personnel, both military and civilian; and all levels of management from the commanding officer to petty officers should be aware of and apply these proven techniques for simplifying work. Most of the production and paperwork problems revolve around the officers and petty officers desks. They know first hand both the work requirements and the problems. They are responsible for insuring that billet duties are carried out, and therefore are in the best position to see that the work

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[1]Bureau of Naval Personnel. Personnel Analysis Division. Work Simplification for Naval Units. NavPers 18359.

is done efficiently. This applies also to developing improvements and to getting action on improvements after they have been developed. Active participation of the officer and the petty officer is essential for the success of a work simplification program.

Work simplification includes five basic techniques:

1. Work Distribution Analysis.
2. Work Count Analysis.
3. Flow Process Analysis.
4. Motion Analysis.
5. Layout Analysis.

No matter which techniques that are employed a uniform method is required by all work simplification efforts. The steps necessary are as follows:

1. Selecting the job to be improved.
2. Recording the job details.
3. Analyzing the job details.
4. Developing the improvements.
5. Installing the new method.

An example of the improvement in efficiency of applying work simplification techniques to a comparably simple operation is the case of the Guard Mail system at Great Lakes Naval Command. Before the simplification techniques were applied, the Guard mail system employed forty-seven people for a total of 45,344 man-hours a year at a cost of $76,177.92 annually. There were fifteen trucks used to distribute the mail at an annual cost of $2,296 .32, for an annual total operating cost of $78,474.24. After a work simplification system was installed the personnel was reduced to seven at an annual cost of $24,460.80 and the trucks used were reduced to four, at an annual cost of $1,118.20, for a total annual cost for running the Guard Mail system of

$25,579.00, or a savings over the previous system of $52,895.24. This shows that if a very minor operation as the Guard Mail system could be improved to the extent of over $50,000 in a year's operation, the savings that might be realized in some of the larger operations, especially if the same degree of improvement could be effected.

Other Management Techniques

There are a number of other management techniques that can be used as applicable to improve efficiency in business or military activities. Some of these are:

Systems Analysis

Forms and Reports Management

The Management Audit

Executive Management Programming

To go into the mechanics and theory of all of the available management systems and techniques is beyond the scope of this paper. The systems of Work Measurement and Work Simplification are believed by the writer to be the most important and are also easily applicable to Naval Shore Activites. The Navy at the present time is short of military personnel to carry out its many functions in support of its mission in the defense of the United States. It must accomplish more with its share of manpower and money. Work Measurement and Work Simplification are just some of the tools to aid the personnel of the Navy in improving its utilization of man-power. It is the writer's belief that without too much extra effort these systems can be installed at Naval Shore Activities, and with the experience and results gained there it might then be possible to carry the program one step further to the ships and units of the fleet.

Many of the systems that are used in the Navy today have evolved down through the years and are based on the best results obtained in the performance of similar functions in the past. This is no reason there might not be a better way to do those functions. For years now the Navy has had a thumb rule that it requires one man working in a Navy mess to do the work required in feeding twenty-five men. The operation has never been measured to see if this is the most efficient ratio. There are civilian cafeterias in Washington, D. C. that have only one man working for every sixty persons fed. The same is true of the yeomen used for clerical work in Naval commands. The allowance of yeomen is based on experience that it takes a certain number of yeomen to do the necessary clerical work per one hundred men in a command. The commands have never measured the amount of correspondence passing through an office and the average time per piece of correspondence to see if the office is over or under staffed. If these functions are measured, it's a pretty safe bet that the approved allowance is in excess of actual personnel needed. This statement is made on the experience that when man-power is reduced below the allowance, there is much lip service given to the shortage of personnel, but the work always seems to get done correctly and on time. This indicates there is probably an excess of personnel in the allowance; for today there are very few, if any, Naval commands operating with full allowance.

Need of Review for some Navy Procedures

There are certain other "standard Navy procedures" that will be questioned why it should be done exactly that way. Why is it necessary to have a central muster of the entire command two or three times a day? This means on the large stations, some personnel lose over an hour's work each day going to and from musters because of the distance from their working area and the muster

location. A muster-on-station would account for the man just as well, and there would be no enroute time used. Another man-hour consuming task is sentry duty. There is no standard policy on how much area a sentry can adequately cover for security purposes. It is usually left up to the commanding officer to provide adequate security for his command. On one station sentries will be posted every one hundred yards. On a similar station in the same area with the same security responsibilities, sentries will be posted every one thousand yards. In these two cases if the allowance of each station is the same, either one station is over-working its personnel or the other station has an excess.

It is a common sight on large Naval stations to see enlisted men lined up for half a block waiting in line to get into the mess hall. The men spend half of their time-off for meals standing in line just to get their ration. A staggering of the meal-hour in the different departments would eliminate most of the waiting and wouldn't delay the entire feeding process. In this case there would not be any gain in working time, but it would be a step in the right direction for improvement of morale.

There is a requirement on most Naval Shore Activities that either one-third or one-half of the compliment of enlisted men must stay aboard each night as a duty section. It depends on what type of activity it is and how much work goes on after the regular working hours. Most shore stations are going to the strictly forty hour week for all hands, due primarily to civilian workers holding key positions. The civilians can't work over forty hours without being paid overtime, and the rest of the station can't work with the civilians absent. By regulations, however, one-third of the military are kept aboard all night every night. This is a case of a large number of men required to stay on the station for no practical purpose except to fulfil the requirements of a general directive from higher authority. Most stations are using civilian fire

departments and civilian security forces, so the old requirement of the need of a duty section to perform these duties is absent. This again doesn't make any more personnel available for the working day, but it would certainly improve morale to allow these personnel to be home with their families, instead of staying on the station with no duties to perform. The morale lift may even show up as an increase in output during the day.

CONCLUSIONS

National man-power resources are limited. If the Navy is going to do an efficient job in its share of the National Defense effort it must use all logical means to accomplish more with its alloted man-power and money. It cannot afford not to use proven administrative and management methods. Many of these proven methods and systems are already in use in the Navy at the present time, but there are two systems specifically, Work Measurement and Work Simplification, that are not being used throughout the Navy. This is especially true as applied to the utilization of military personnel.

If better man-power utilization is to be accomplished naval personnel need to be motivated in this direction. Work Measurement and Work Simplification Systems have the potentialities for providing this motivation. Both systems are applicable to the military man-power situation in the Navy, and can be put into effect by introducing them at the lowest administrative echelon, and having the backing of top echelon.

Ignorance of the systems and the advantages that can be derived from them now exists in general throughout the Navy. This means an indoctrination and education program as outlined earlier in this paper. One of the first reactions to such a program is--"just a lot of more figures and reports." It will be discovered that a large amount of the data necessary for a Work Measurement program is already available in reports already compiled at the activity.

Unrelated management techniques and programs generate figure frustrations in the act of exercising control. Management's figure frustrations are

the greatest when the relatively new management control technique, Work Measurement, is improperly applied. In name, as well as application, Work Measurement has not, as yet, taken its rightful position in the dynamics of business administration. If business administration is to be considered an art, in an all inclusive sense, then some skillful and systematic arrangement and adaptation of man-power figures of all principal management control techniques and programs must be conceived and installed. Work Measurement will operate as a keystone for this management control.

Work Measurement, Work Simplification, or any other management technique is not the solution to all management problems and shouldn't be considered as such. Like cost accounting or on site inspections, Work Measurement merely supplies information and suggests questions. It does not by itself solve any problems or save any money. The potential of Work Measurement is realized only to the extent that it is applied and used with imagination, energy, and a practical sense of proportion. Merely having a work measurement program is not enough. Work Measurement needs to be used, to be useful. But it should not be used by itself. Work Measurement tells only part of the story. It focuses on amounts of work and output. In almost any management situation quality, costs, safety, effectiveness and morale are also important, and they best can be measured by other means. The basic element of a Work Measurement program is to provide management at all levels and all organizational segments of the command with reliable and valid production data on a periodic basis which will reflect the productivity of each functional area which contributes to the mission of the command, and the productivity of functional areas in similar commands having similar missions.

To stress the fact that techniques and systems are not believed to be the answer to all management problems, Harold D. Smith said in his book, "The Management of Your Government":

> The preoccupation of the managerial profession with techniques, methods, and means is characterized in our society by big business and big government, considerable attention must be paid to techniques and methods in order to keep organization functioning. But this is a snowballing process. As the further refinement of managerial methods permits the construction of larger organizations, they, in turn, require more attention to managerial techniques.
>
> The truly able managers are the ones who--by intuition, by hunch, by observation, by rule of thumb---can see and sense matters that do not yield to purely scientific gauges of management. They evaluate objectives, they can stimulate the spirit of an organization---all without much reliance upon the tools of management.
>
> The paradox of contemporary administration is this: As we ask our society to undertake larger and larger programs, we are compelled to concern ourselves with smaller and smaller routines. This is the fate not only of management procedures but of management techniques as a whole. We have noted a similar proliferation in legal procedures, research, reporting, and public relations techniques, administrative planning, budgeting and financial controls, and personnel management. We may be able to extent the boundaries of human effort and raise the hopes of people everywhere, but only at the expense of deepening our interests in the humbler questions of management technique.[1]

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[1] George R. Terry, Principles of Management (Homewood, Ill.: Richard D. Irwin, Inc. 1953), 150.

RECOMMENDATIONS

1. That a short orientation program in management be given officers in key administration billets on being ordered to such billets.

2. That a manual be compiled on Work Measurement and Work Simplification systems as they apply to military personnel. This should be done by each Bureau, and the manuals distributed to the activities and stations under its management control. Most of the Bureaus have Work Measurement manuals now, but they are directed at the civilian work functions with military work out-put showing in the reports as total productive man-hours (military) for each department, or division. For example, the operations department of an air station is broken down into one function "operations." The work unit is--"number of flights." There has been no attempt to measure the many functions of the operations department.

3. That all Naval Shore Activities be directed to install local command Work Measurement and Work Simplification systems with emphasis on each activity setting its own work units for its functions, and determining its own standards during the indoctrination period.

4. That no reports on Work Measurement data be forwarded to Bureau level during an indoctrination period of at least six months.

5. That cognizant Bureaus direct their activities to forward monthly reports <u>after</u> the indoctrination period, providing the activities with guidelines for these reports, but setting no standards at this time.

6. That after the Bureaus have received enough monthly reports to establish an evaluation trend, then set standards for similar functions in

similar activities.

7. That the installation of Work Measurement and Work Simplification systems won't solve all management problems, but it will encourage officers in administrative billets to develop a systematic method of attacking these problems.

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